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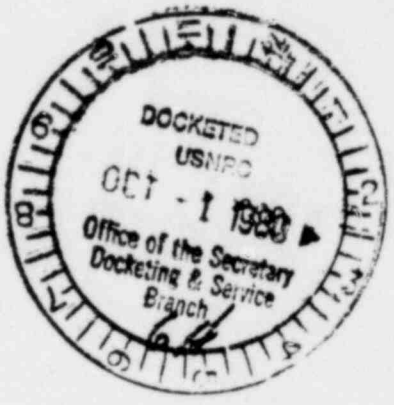

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Secretary of the Commission
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Docketing and Services Branch

Subject: Comments on the Proposed Changes to 10CFR 50, 51 and 100. Federal Register Notices of July 28, 1980

Gentlemen:

Your intention to modify the regulations concerning the siting of nuclear power reactors has the potential to be of considerable value to the nuclear industry and to the nation. The potential value stems not from the adoption of the modification as proposed out rather from a discussion of the fundamental protection philosophy on which the proposed changes are based. Without a discussion of the fundamental safety philosophy an understanding of the proposed modifications is difficult and the need for the proposed changes is questionable (even on an interim basis) especially in light of the limited number of applications likely to be seen by the Commission in the near future. In fact, a clear understanding and establishment of a fundamental safety philosophy could potentially be of great value relative to regulatory decisions on many of today's operating plants.

I offer the attached comments in light of the need to establish fundamental safety basis, without which the value and meaning of any regulation is questionable.

Sincerely yours,

J. N. Vance

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JNV/smm

Attachment

L-4-1 PT50

Acknowledged by card 10/1/80

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COMMENTS ON THE

PROPOSED CHANGES TO 10CFR 50, 51 & 100

ON

REACTOR SITING CRITERIA

It is difficult to comment on the proposed rulemaking for Reactor Siting Criteria in the absence, as pointed out by the ACRS, of an overall framework of safety philosophy which would form the fundamental basis on which the rule is being established. The following comments are provided on what I consider rudiments of such a framework and then on the merits of the proposed criteria as they relate to the proposed framework.

I believe that the framework of a safety philosophy would include four basic elements; two of which are mandatory and two of which are matters of prudency. The first mandatory element requires that the risk of injury or loss of life to any individual be reduced to a level considered acceptable. There are probably several approaches that could be used to reasonably determine or define an acceptable level of risk. In addition to protecting all individuals, the second mandatory element would require that the impact on the total population be kept to levels considered acceptable. (i.e., the loss of members from the population would not be so large as to jeopardize the total population.) These two elements are mandatory and would require the identification of reasonable levels of protection which would be considered acceptable.

The elements which are matters of prudency would embody an ALARA concept where the individual risks and population impacts would be reduced as far below the acceptable levels as reasonably achievable. This would require the establishment of a methodology to conduct a cost-benefit analysis in which the benefits of reduced individual risk and reduced population impact are compared to the additional costs of the protective measures where the benefits and costs are stated in equivalent terms. This raises the question of whether or not the improvement in an individual's quality of life by the reduction in his risk or the reduction in the number of members lost in a population can be measured in terms equivalent to the cost of the protective measures which are normally stated in dollars. While this is a difficult question it would seem that the

question is not beyond reasonable resolution, if it is remembered that the question resides in the prudent portion of the framework and not the mandatory portion. Therefore, although it would be desirable to rigorously equate the terms in the ALARA evaluation it may not be absolutely essential but it may be that a reasonable estimate will suffice. Figure 1 graphically depicts the safety framework described above.

FIGURE 1 - SAFETY FRAMEWORK

	PROTECTION OF INDIVIDUALS	PROTECTION OF THE POPULATION
MANDATORY ELEMENTS	Risk of loss of life or injury to any individual must be reduced to levels considered acceptable.	Loss of members of a population must not be so large as to jeopardize the total population. This level is likely to be so high that it would play no role in reactor siting.
PRUDENT ELEMENTS	Risks should be reduced as far below the acceptable level as reasonably achievable. Requires a reasonable cost-benefit analysis where costs are balanced against the improved quality of life for an individual exposed to lower risks.	Loss of members of a population should be reduced as far below the acceptable level as reasonably achievable. Requires a reasonable cost-benefit analysis where costs are balanced against the benefit of a reduction in the number of members lost to a population.

This framework then attaches the greater importance to the protection of individuals. The acceptable level of protection for the population impact, as one of the mandatory elements, is likely to be so high that it will have little relevance for reactor siting owing to the nature, size and frequency of severe reactor accidents. The line of reasoning is that the U.S. has apparently shown a capacity to tolerate 125,000 deaths/year from accidental causes alone which is much greater than any population impact envisioned for nuclear plants. Thus, in addition to the individual protection element, the only other elements to be addressed are the elements relative to the ALARA considerations for the individual risk and the population impact. Because of the mandatory character, the protection of the individual becomes the prime focus of protection criteria and understandably requires greater vigor in the establishment of such criteria. The ALARA considerations for the individual risk and the population impact are of secondary concern and correspondingly, it would seem, should require less vigor in the establishment of protection criteria.

In concept the above safety philosophy seems straightforward; however, the development of detailed protection criteria in the implementation of such a framework may be difficult. The difficulties may arise (1) because of the uncertainties in the ability to measure the risk to individuals and in the determination of the acceptable risk level and (2) from a need to establish criteria with which the demonstration of compliance is not an onerous task. With this in mind and the safety framework as background the following approach to reactor siting seems appropriate.

PROTECTION OF INDIVIDUALS

Because of the uncertainty involved in the ability to measure the risk from a nuclear plant (i.e., the uncertainty in the plant response to perturbations) it may be prudent to conservatively establish the acceptable individual level of risk or provide independent protection measures which provide protection overlap (defensive in-depth) or both. For the present it seems prudent to invoke a defense-in-depth approach to protect site boundary individuals by establishing a minimum exclusion distance. The minimum exclusion distance would be established based on a realistic assessment of the effectiveness

of evacuation procedures. Because of the defense-in-depth approach it would seem that a minimum exclusion distance should be established (based on the desired degree of overlap protection) irrespective of compensating plant design features. It should be noted, however, that with the passage of time greater knowledge of the likely response of a nuclear plant to a perturbation is gained and greater improvements in the reliability of plant protection features are accomplished both of which indicate that a reduction in the degree of overlap is warranted. It is conceivable that the defense-in-depth approach to siting could be greatly reduced or eliminated. Because of this it would seem that the siting criteria should be re-evaluated on a periodic basis to re-examine the degree of overlap in protection deemed appropriate for the level of understanding of an actual risk from a nuclear plant.

The question of whether an alternative site with a larger exclusion distance is more desirable would depend on the outcome of the cost-benefit analysis. Since both sites will presumably meet the minimum acceptable risk to the site boundary individual, the site which, by virtue of a larger exclusion distance, will yield a lower individual risk should be evaluated as an ALARA consideration. The cost-benefit analysis would compare the cost of siting the plant at either site against the reduction in risk to the individual achieved by the larger exclusion distance.

Consideration could be given to the establishment of minimum population density and distribution criteria if it is shown that population densities or distributions above a given level will affect the evacuation effectiveness and thereby giving rise to individual risks above the acceptable level. The specification of a population density limit (if required to achieve the minimum acceptable individual risk) should take into account wind direction frequencies relative to the direction of the site limiting population densities. As a part of the defense-in-depth approach it seems that the establishment of minimum standoff distances for man-made hazards is appropriate. However, the establishment of such distances should consider the likelihood of occurrence of the hazard and the likelihood of an adverse impact on the plant. The adverse impact should

be defined to be the impairment of the safe shutdown capability of the plant and should realistically reflect the nature of the impact on the plant with margin added to account for uncertainties in the impact of the event.

POPULATION IMPACTS

It is not likely that the minimum acceptable impact on the population will be exceeded at the siting criteria established for the protection of individuals and, therefore, minimum acceptable population density and distribution criteria are not likely to be required for the protection of the population. However, population densities and distribution differences between sites should be evaluated in a cost-benefit evaluation to meet the ALARA portion of the safety framework. The cost of siting a reactor at the different sites should be balanced against the reduced population impact for the site with the lower population density. (Evacuation should be taken into account in the population density evaluation.) Such items as site availability and regional need for power can be factored into the ALARA cost-benefit analysis performed in the site selection process. Ideally it would seem appropriate to consider the population parameters which are projected to exist over the lifetime of the plant as this population is the population which will ultimately be protected.

SUMMARY

Assuming that a degree of overlap in protection is desirable and that the overlap is to be accomplished by minimum siting criteria, the following seem to be key protection elements based on the above framework.

1. The establishment of a minimum exclusion distance is not likely to provide significant protection for the limited number of individuals living at or near the exclusion boundary because of the high degree of effectiveness of evacuation procedures expected for this group of people. However, some minimum exclusion distance seems appropriate to account for the small uncertainty in evacuation procedures.

2. Population density and distribution criteria for the region fairly close to the reactor site are likely to be important as they relate to the effectiveness of the evacuation procedures being implemented for the protection of individuals in the closer regions. It would seem that the probability of <u>not</u> being evacuated in an event must increase with increasing numbers of people involved. And generally, the number of people involved increases as a function of radial distance from the plant. Therefore, at any given population density a curve could be developed showing the probability of not being evacuated vs. distance from the site. The plot of radiation dose vs. distance (which shows decreasing dose with distance because of dispersion) could be superimposed on the evacuation plots. Since the risk to the individual (excluding the plant response) is the product of the dose and the probability of not being evacuated, the population density curves in combination with the dose curve would allow the identification of the maximum acceptable population density which corresponds to the acceptable value for the product.

3. Those sites which meet the above two items should be identified as acceptable. The best of those sites identified as acceptable would be selected on the basis of a cost-benefit analysis of the population, impacts vs. costs of locating the plant at each site, compensating design features in the plant.